NON-PUBLIC?: N
ACCESSION #: 9206100095
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Nine Mile Point Unit 1 PAGE: 1 OF 6

DOCKET NUMBER: 05000220

TITLE: Reactor Scram on High Neutron Flux Caused by Failures in the Electronic Pressure Regulator
EVENT DATE: 05/01/92 LER #: 92-003-00 REPORT DATE: 06/01/92

OTHER FACILITIES INVOLVED: DOCKET NO: 05000

OPERATING MODE: N POWER LEVEL: 097

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION:
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
NAME: R. L. Tessier, Manager Operations TELEPHONE: (315) 349-2707
NMP1

COMPONENT FAILURE DESCRIPTION:
CAUSE: X SYSTEM: TG COMPONENT: PC MANUFACTURER: G080
REPORTABLE NPRDS: Y

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

On May 1, 1992 at 1434 hours, with the mode switch in the "RUN" position and reactor power at approximately 97 percent, Nine Mile Point Unit 1 (NMP1) experienced a Reactor Protection System (RPS) actuation. Specifically, a full reactor scram caused by neutron flux exceeding the flow-biased Average Power Range Monitor (APRM) scram setpoint. Additionally, the High Pressure Coolant injection (HPCI) System initiated on low reactor water level, as expected.

The cause of the high neutron flux scram was a small, but rapid, pressure increase. The most likely causes of the pressure increase are loose, oxidized and intermittent electrical connections at one of the Electronic Pressure Regulator's (EPR) four Linear Variable Differential Transformers (LVDTs) and electrical noise between adjacent field wiring.

Corrective actions were to stabilize and cool down the reactor in accordance with plant procedures, and to correct the EPR deficiencies identified during troubleshooting.

END OF ABSTRACT

I. DESCRIPTION OF EVENT

On May 1, 1992 at 1434 hours, with the mode switch in the "RUN" position and reactor power at approximately 97 percent, Nine Mile Point Unit 1 (NMP1) experienced a Reactor Protection System (RPS) actuation. Specifically, a full reactor scram caused by neutron flux exceeding the flow-biased Average Power Range Monitor (APRM) scram setpoint. Additionally, the High Pressure Coolant injection (HPCI) System initiated on low reactor water level, as expected.

NMP1 utilizes the Mechanical Hydraulic Control (MHC) Turbine Control System. Before the scram, the Electronic Pressure Regulator (EPR) was controlling reactor pressure and the Mechanical Pressure Regulator (MPR) was being used as a backup.

Prior to the scram, operators noticed an abnormality with the turbine steam chest pressure. Pressure was greater than normal and operators were investigating the abnormality. Prior to the conclusion of this work, the reactor scrammed. Troubleshooting of the steam chest pressure indication at the time did not cause or impact the transient.

The cause of the neutron flux scram was a change in the turbine flow control valve position, which in turn resulted in a small but rapid pressure increase in the reactor vessel. From the data evaluated, pressure increased due to turbine flow control valves closing approximately 10 percent. A peak reactor pressure greater than 1050 pounds per square inch gauge (psig) but less than 1068 psig (the high pressure scram setpoint) was reached.

Following the scram signal, all control rods inserted to position 00. The turbine tripped 5 seconds after
he scram signal, and the generator
tripped 5 seconds after the turbine trip, as expected. HPCI initiated on low reactor water level following the scram, as expected. HPCI brought reactor water level up to approximately + 98 inches (scale). The lowest reactor water level reached was approximately + 27 inches (scale).

Several problems were identified as a result of the scram:

1. Feedwater pump 12 tripped following the scram, when the highreactor water level trip point (+ 95 inches) was reached.

2. Turbine turning gear did not automatically engage following turbine coastdown.

3. Two (2) computer points for closure times of a set of scram discharge volume vent and drain valves did not print out on the alarm typer.

Additionally, immediately prior to the scram, reactor pressure was 5 psig greater than normal, feedwater temperature was 6 degrees Fahrenheit less than normal, and plant efficiency was less than normal. The turbine flow control valves were shut more than normal for the reactor power level (i.e., 90 percent open versus an expected value of 96 percent open).

II. CAUSE OF EVENT

Extensive troubleshooting was performed by Niagara Mohawk personnel, assisted by General Electric (the equipment supplier) personnel. Five (5) Work Requests were written to check the EPR's power supply, the Linear Variable Differential Transformer's (LVDTs) linkages and coils, LVDT wire lugs and terminal boards, the integrity of all connections in the EPR cabinet and to recalibrate the valve position recorder. Upon completion of maintenance, a turbine flow control valve position flow simulation was performed. (See short term corrective actions, Nos. 2 through 7 for details). As a result of this effort, the most likely causes of the turbine flow control valves closing have been determined to be:

1. Loose, oxidized and intermittent electrical connections at one of the EPR's four (4) LVDTs.

2. Electrical noise between adjacent field wiring.

A contributing cause may be that the Mechanical Pressure Regulator's (MPR) setpoint was set too high to be effective as a backup pressure regulator for the EPR.

The cause of the high neutron flux scram (RPS actuation) was a small, but rapid, pressure increase. This pressure increase collapsed voids, adding positive reactivity and causing the neutron flux spike to reach the flow-biased APRM scram setpoint.

III. ANALYSIS OF EVENT

This event is reportable in accordance with 10CFR50.73 (a)(2)(iv), "any event or condition that resulted in manual or automatic actuation of any Engineered Safety Feature (ESF), including the Reactor Protection System (RPS)."

The flow biased APRM scram is an automatic Reactor Protection System action to prevent exceeding a fuel cladding safety limit. The integrity of the fuel clad as a barrier to the release of fission products is assured if a safety limit is not exceeded.

The flow this event, as the turbine flow control valves closed, reactor pressure increased and the flow-biased APRM scram setpoint was reached. A high reactor pressure scram was available as a backup to the flow-biased APRM scram.

The initiation of the flow-biased APRM scram and HPCI System are protective modes of operation, and they performed their intended functions. There were no adverse safety consequences as a result of this event, nor was the reactor in an unsafe condition during or after this event.

There were no adverse consequences to the health and safety of the general public or plant personnel as a result of this event.

IV. CORRECTIVE ACTIONS

Short term corrective actions

1. Stabilized and cooled down the reactor in accordance with plant procedures.

2. Work Request (WR) #203243 was written to check the EPR's power supply. The power supply was found to have no problems.

3. WR #203245 was written to inspect mechanical linkages for wear, binding and lost motion. An LVDT linkage was found to have a deadband and will be repaired before plant startup.

4. WR #203391 was written to check LVDT coils for shorts and opens, to check continuity of wires, and to inspect wire lugs and terminal boards. A terminal board was found to have slight corrosion and was

cleaned, and another terminal board was found to have mechanical damage and was replaced. A seven ohm ground, which could cause noise, was found and corrected. One wire was reterminated.

5. WR #203260 was written to check the integrity of all connections in the EPR cabinet. The electrical connections were found to be very good.

6. WR #182584 was written to recalibrate the control room's valve position recorder. As found values were very close to calibration values, requiring only minor adjustments.

7. After maintenance, a 90 percent turbine control valve position flow simulation was performed to verify proper electrical response of the EPR. The EPR responded normally.

8. A special test will be performed during reactor startup to verify proper operation of the EPR. The results of the test will be analyzed for potential operating procedure changes.

9. Additional monitoring instrumentation has been installed on the turbine controls. This will help to determine the source of the problems should they occur again.

10. Deviation/Event Report (DER) #1-92-1987 was written to investigate the cause of Feedwater Pump 12 tripping. The investigation revealed that the controller for the flow control valve was in the manual mode and had a small demand open signal (i.e., was not fully closed). When the + 95 inch reactor water level was reached and the flow control valve was not fully closed, the logic was satisfied to trip Feedwater Pump 12. Thus, the system performed as designed. The DER has been completed.

IV. CORRECTIVE ACTIONS (cont.)

11. Work Request #202547 was written to troubleshoot the problem with the turbine turning gear not automatically engaging. No equipment failures could be found. When tested, the turbine automatically went on the turning gear.

12. Two (2) computer points not printing on the alarm typer following the scram is due to limitations of the process computer. This problem was previously identified, and will be addressed with the installation of a new scanner and process computer in 1994.

13. Deviation/Event Report (DER) #1-92-1940 was written for operation with reduced feedwater temperature. Nuclear Engineering dispositioned the DER by providing guidance on minimum feedwater temperatures for operation, and this guidance has been incorporated into the operating procedure.

14. The operating procedure for the turbine has been changed to provide guidance on adjusting the MPR setpoint slightly higher than the EPR setpoint.

Long term corrective action

1. Evaluate General Electric's final report on turbine controls for changes in preventive maintenance, corrective maintenance, and modifications.

V. ADDITIONAL INFORMATION

A. Failed components: The Electronic Pressure Regulator's (EPR) Linear Variable Differential Transformers (LVDT's)
electrical connections.

B. Previous similar events:

LER 92-08 describes a scram from approximately 98 percent power due to high neutron flux. A failure of the MPR's servo motor position indicator made it difficult for the control room operator to manually control reactor pressure when using the MPR.

LER 87-14 describes a scram from 88.5 percent power due to high neutron flux. A stuck servo valve in the Electronic Pressure Regulator hydraulic actuator caused Turbine Control Valve oscillations, and the resulting scram.

LER 85-05 describes a reactor scram from power due to high neutron flux. The electronic pressure regulator was in control at the time of the scram, however, maintenance on the mechanical pressure regulator found the stroke to be binding and sticky.

V. ADDITIONAL INFORMATION (cont.)

LER 84-18 describes a reactor scram during startup, at approximately 4 percent thermal power, due to low reactor water

level. The mechanical pressure regulator sent erroneous open and then close signals to the turbine bypass valves, causing reactor water swell and shrink. The mechanical pressure regulator was cleaned, lubricated and returned to service, and performed satisfactorily.

The corrective actions from these previous similar events would not have prevented this LER from occurring.

C. Identification of components referred to in this LER:

Table omitted.

ATTACHMENT 1 TO 9206
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NIAGARA MOHAWK

NIAGARA MOHAWK POWER CORPORATION/Nine Mile Point Nuclear Station Unit #1,
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Plant Manager

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June 1, 1992
NMP84895

United States Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

RE: Docket No. 50-220
LER 92-03

Gentlemen:

In accordance with 10CFR50.73, we hereby submit the following Licensee Event Report:

LER 92-03 Is being submitted in accordance with 10CFR50.73 (a)(2)(iv), "any event or condition that resulted in manual or automatic actuation of any Engineered Safety

Feature (ESF) including the Reactor Protection System
(RPS)."

This report was completed in the format designated in NUREG-1022,
Supplement 2, dated September 1985.

A 10CFR50.72 report was made on May 1, 1992 at 1506 hours.

Very truly yours,

Kim A. Dahlberg
Plant Manager - NMP1

KAD/JTP/lmc
ATTACHMENT

xc: Thomas T. Martin, Regional Administrator
Wayne L. Schmidt, Senior Resident Inspector

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